

April 28, 2017



U.S. Department
of Transportation

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

**Pipeline and Hazardous
Materials Safety Administration**

DOT-SP 20443

EXPIRATION DATE: 2019-11-30

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Orbital Sciences Corporation
Dulles, VA
2. PURPOSE AND LIMITATION:
 - a. This special permit authorizes the transportation in commerce of certain non-DOT specification containers containing certain Division 2.1, 2.2, and 2.3 liquefied and compressed gases and other hazardous materials identified in paragraph 6 of the special permit. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
 - b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce.
 - c. No party status will be granted to this special permit.
 - d. This special permit serves as an "exemption" as defined in 1;3.1.1 of the ICAO TI and as a "Competent Authority Approval" as defined under 49 CFR § 107.1.
 - e. This special permit serves as an exemption to the ICAO Technical Instructions (ICAO TI) for the transportation of UN1005, Ammonia, anhydrous aboard cargo aircraft. For international flights, the ICAO TI may require exemption authorization by the States of origin, transit, over flight, and destination of the consignment, as well as the State of the air operator.

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3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.
4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR 172.101 Column (9B) in that lithium batteries may not exceed 35 kg, § 173.301(f) in that containers are not fitted with pressure relief devices, and §§ 173.302a(a)(1), and 173.304a(a)(2) and Packing Instruction 200 of the ICAO TI in that non-DOT specification packagings are authorized, and Column (9B) of § 172.101 Hazardous Materials Table and Columns 12 and 13 in Table 3-1 of the ICAO TI is waived in that anhydrous ammonia is forbidden for cargo air transport, and the "Q" value requirements for anhydrous ammonia in 4;1.1.9(e) of the ICAO TI are waived, except as provided herein.
5. BASIS: This special permit is based on the application of Orbital Sciences Corporation dated December 12, 2016 submitted in accordance with § 107.105, and the public proceeding thereon.
6. HAZARDOUS MATERIALS (49 CFR 172.101):

Hazardous Materials Description			
Proper Shipping Name	Hazard Class/Division	Identification number	Packing Group
Ammonia, anhydrous	2.2/2.3 [*]	UN1005	N/A
Batteries, Wet, Non-Spillable	8	UN1005	N/A
Cartridges, Power Device	1.4C	UN0276	II***
Cartridges, Power Device	1.4S	UN0323	II***
Chlorodifluoromethane	2.2	UN1018	N/A
Ethane	2.1	UN1035	N/A
Helium, compressed	2.2	UN1046	N/A
Lithium ion batteries**	9	UN3480	N/A
Lithium ion batteries contained in equipment	9	UN3481	N/A

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Hazardous Materials Description			
Proper Shipping Name	Hazard Class/ Division	Identification number	Packing Group
Lithium Metal Batteries, contained in equipment	9	UN3091	N/A
Methane, Compressed or Natural Gas, Compressed (with high methane content)	2.1	UN1971	N/A
Nitrogen, Compressed	2.2	UN1066	N/A
Refridgerant gas, R-404A	2.2	UN3337	N/A
Propane see also Petroleum gases, liquefied	2.1	UN1978	N/A
Propylene see also Petroleum gases, liquefied	2.1	UN1077	N/A
Toluene	3	UN1294	II
Xenon, Compressed	2.2	UN2036	N/A

* Division 2.3 for international transportation. Division 2.2 as an alternate when only domestic transportation is involved.

**No packaging group assigned for international transportation.

*** Packaging and transportation must be in accordance with the International Civil Aviation Organization's Technical Instructions for the Safe Transportation of Dangerous Goods by Air (ICAO TI).

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Packagings prescribed are non-DOT specification containers which are installed in spacecraft or components of spacecraft and over-packed in either the "Antonov" shipping container or "Galileo" shipping container. Both designs are on file with the Office of Hazardous Materials Safety Approvals and Permits Division. The non-DOT specification containers are without valves or pressure relief devices and described as follows:

(1) Heat pipes or variable conductance heat pipes are constructed of axially grooved tubing (aluminum alloy 6063 or 300 series stainless steel or combination thereof) with an end cap and fill tube welded to opposing ends, not to exceed 1 liter in volume. A schematic diagram is on file with the Office of Hazardous Materials Safety Approvals and Permits Division.

(2) Capillary pumped loops constructed of 6061-T6 aluminum or 300 series stainless steel or combination thereof, not to exceed 144 inches in length and 100 inches wide, and not to exceed 4 liters in volume.

(3) Reservoirs constructed of 6061 aluminum or 300 series stainless steel, not to exceed 4 liters in volume. The maximum size of the reservoir is 6 inches in diameter and 24 inches in length.

(4) The satellite will contain from 1 to 4 identical xenon tanks, depending on the mission propellant needs. Each xenon tank may contain up to 505 pounds of xenon for a satellite total of up to 2020 pounds. The Xenon Tanks will conform to the American Institute of Aeronautics and Astronautics, "Space Systems-Composite Overwrapped Pressure Vessels (COPVs)", Standard ANSI/AIAA S-081A-2006. The xenon tank is constructed of a titanium metal liner overwrapped with layers of a high performance carbon fiber and epoxy resin. Each xenon tank has the following characteristics:

Tank Dimensions	40.52" long x 16.50" diameter
Tank Full Load Xenon Capacity	505 lbs of Xenon
Tank Shell Material	Titanium
Tank Overwrap Material	Carbon Fiber
Maximum Expected Operating Pressure (MEOP) at 122 °F during shipment	2,700 psig (MEOP)
Proof Test Pressure	3,375 psig (1.25 x MEOP)
Burst Design Pressure	4,050 psig (1.50 x MEOP)
Actual Burst (rupture) Test Pressure at 122 °F	5,926 psig (2.19 x MEOP)

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The satellite xenon tanks are located within the satellite center cylinder structure. A schematic diagram of the xenon tank and its arrangement is on file with the Office of Hazardous Materials Safety Approvals and Permits Division.

(5) Each satellite contains up to sixteen (16) single-use pyrovalves (Part Nos CRM-4651D and/or CRM-4308D). Each pyrovalve contains one booster and two initiator power cartridges. The schematic is on file with the Office of Hazardous Materials Safety Approvals and Permits Division.

b. TESTING -

(1) For the heat pipes described in paragraph 7a.(1), (2), and (3) above, testing is as follows:

(i) Welds must be tested using an appropriate non-destructive examination (NDE) technique described in ASTM-E1742, NAS1514, (Air Force Space Command Manual) AFSPCMAN 91-910 Vol 3 or an equivalent specification.

(ii) Each non-DOT specification container must be pneumatically tested to pressure 1.5 times the vapor pressure of the lading at 100°C (212°F) without failure and must have minimum burst pressure of at least 1,500 psig.

(2) For the Xenon tanks described in paragraph 7a.(4) above, testing must be in accordance with the American Institute of Aeronautics and Astronautics, "Space Systems-Composite Overwrapped Pressure Vessels (COPVs)", Standard ANSI/AIAA S-081A-2006

c. OPERATIONAL CONTROLS -

(1) Each heat pipe may not contain more than 0.35 pound of anhydrous ammonia.

(2) At 54.4°C (130°F), the design burst pressure of the heat pipes must be at least 4 times the vapor pressure of the lading.

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(3) Emergency response information provided with the shipment and available via an emergency response telephone number must indicate that the heat pipes are not fitted with pressure relief devices and provide appropriate guidance in case receptacles are exposed to fire.

8. SPECIAL PROVISIONS:

a. A person who is not a holder of this special permit who receives a package covered by this special permit may reoffer it for transportation provided no modifications or changes are made to the package and it is reoffered for transportation in conformance with this special permit and the HMR.

b. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

c. MARKING - The outer transport container will be plainly and durably marked on two opposite sides in characters at least 2 inches high on a contrasting background "DOT-SP 20443" and "DO NOT STACK" as specified in §172.301(c).

d. Transportation of Division 2.3 materials (gases which are toxic by inhalation) are not authorized aboard aircraft unless specifically authorized in writing by the Approvals and Permits Division, as provided in Special Provision A2 of the ICAO Technical Instructions for the Safe Transportation of Dangerous Goods by Air.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, cargo vessel, and cargo aircraft only.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel, aircraft or motor vehicle used to transport packages covered by this special permit. The shipper must furnish a current copy of this special permit to the air carrier before or at the time the shipment is tendered.

11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

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- o All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
- o Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.
- O Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this special permit, including display of its number, when the special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) - "The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 - Immediate notice of certain hazardous materials incidents, and 171.16 - Detailed hazardous

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materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit

Issued in Washington, D.C.:



for William Schoonover
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: AS/TG